Getting Started with the Oasis Tower Board

1 Overview

The Oasis Tower Board is a device based off of Freescale's Kinetis KW2x Tower System Module and the TWRKW24D512 device. This user manual is designed to guide users in the process of gathering the necessary resources and configuring the correct settings in the integrated development environment (IDE) in order to run an application. In this guide, we will be using a demonstration application from the Kinetis Software Development Kit.

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2 Resources

In order to be able to complete each step of this guide, you will need the following:

- Oasis Module Tower Board
- IAR Embedded Workbench or other supported IDE
- Kinetis Software Development Kit (KSDK)
- P&E's USB Multilink Universal development interface
- BeeKit Wireless Connectivity Toolkit (recommended)

NOTE: It is highly recommended that you install the BeeKit Wireless Connectivity Toolkit **before** connecting the board to your system. The drivers in this toolkit will allow you to use the device to its fullest potential. See Section 4 for detailed instructions.

2.1 Downloading and Installing IAR Embedded Workbench

The Oasis Tower Board supports many other IDEs, but for this guide we will be using IAR Embedded Workbench. Once you have downloaded and installed IAR Embedded Workbench, you will be asked to enter a license number. If you do not already have a license number, then click **Register with IAR systems to get an evaluation license.**

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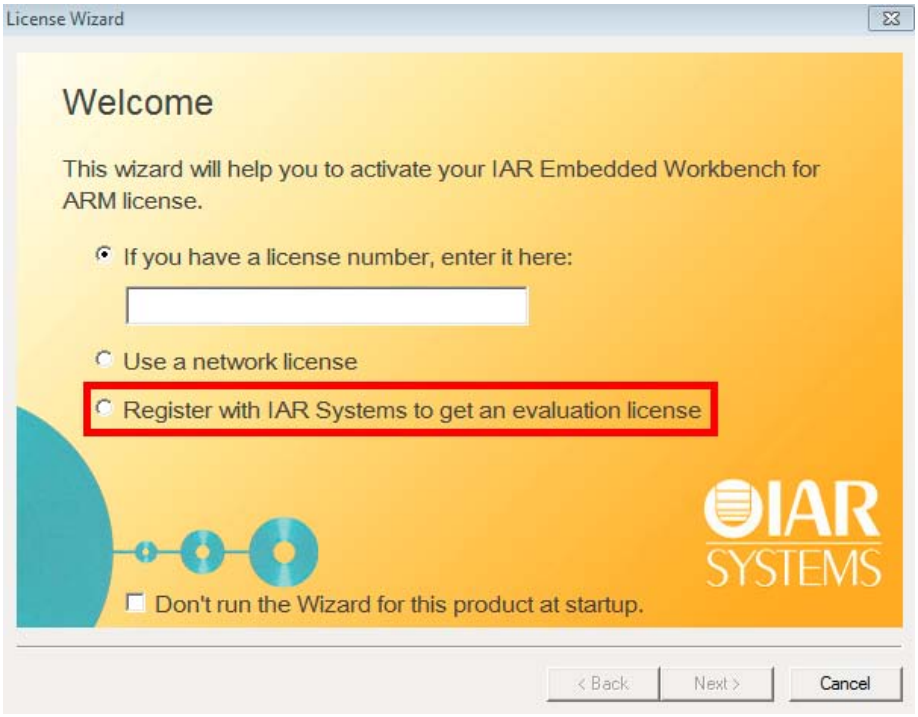
License Wizard
Welcome
This wizard will help you to activate your IAR Embedded Workbench for ARM license.
If you have a license number, enter it here:
Use a network license
Register with IAR Systems to get an evaluation license
IAR SYSTEMS
Don't run the Wizard for this product at startup.
< Back
Next >
Cancel

When asked to select an evaluation license type, you may choose either the **30-day time-limited evaluation** or the **Kickstart, size-limited evaluation.** Choose a license type that will best fit your needs. After registering and confirming your registration, you will be emailed a link which contains your assigned license number. Enter this license number into the textbox of the license wizard to activate IAR Embedded Workbench (make sure to include the hyphens when typing in the license number).

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2.2 Downloading the Kinetis Software Development Kit

Now that IAR Embedded Workbench is installed and activated, you are now able to load programs into the device. First, we will download demonstration applications which are in the Kinetis SDK located on Freescale's website. The example application we will be using is only available in the previous versions of KSDK, so click on the **"Previous"** tab. Choose the **KSDK v1.1.0 standalone release for the K21DA and KW24D devices** as shown below.

Current | Previous

Version	Description	Date Available	
1.1.0	KSDK v1.1.0 Mainline releases	Dec 20, 2014	Download Log
1.1.0	KSDK v1.1.0 standalone release for the FRDM-KL26Z and MRB-KW01	Mar 20, 2015	Download Log
1.1.0	KSDK v1.1.0 standalone release for the FRDM-KL27Z	Mar 13, 2015	Download Log
1.1.0	KSDK v1.1.0 standalone release for the TWR-KV46F150M	Feb 23, 2015	Download Log
1.1.0	KSDK v1.1.0 standalone release for the K21DA and KW24D devices	Feb 16, 2015	Download Log
1.1.0	KSDK v1.1.0 standalone release for the TWR-K21F120M	Jan 30, 2015	Download Log
1.0.0	KSDK v1.0.0 standalone release for the FRDM-KL43Z and TWR-KL43Z48M	Jan 14, 2015	Download Log

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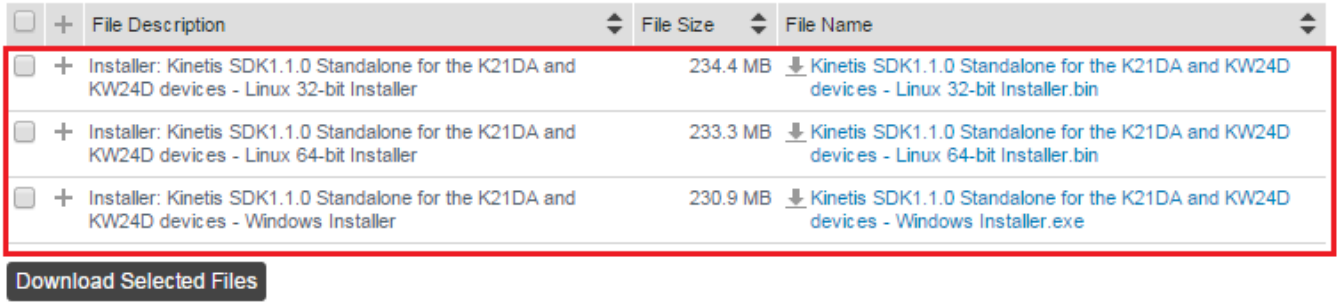
Then, choose the appropriate version for your operating system by selecting the checkbox and proceed with the download.


File Description
File Size
File Name
Installer: Kinetis SDK1.1.0 Standalone for the K21DA and KW24D devices - Linux 32-bit Installer
234.4 MB
Kinetis SDK1.1.0 Standalone for the K21DA and KW24D devices - Linux 32-bit Installer.bin
Installer: Kinetis SDK1.1.0 Standalone for the K21DA and KW24D devices - Linux 64-bit Installer
233.3 MB
Kinetis SDK1.1.0 Standalone for the K21DA and KW24D devices - Linux 64-bit Installer.bin
Installer: Kinetis SDK1.1.0 Standalone for the K21DA and KW24D devices - Windows Installer
230.9 MB
Kinetis SDK1.1.0 Standalone for the K21DA and KW24D devices - Windows Installer.exe
Download Selected Files

Run the KSDK installer and choose the installation directory. When asked to choose the **install set**, choose **Kinetis SDK Basic.** Inside the installation directory are several folders which include the demonstration applications (located in <install-dir>/demos) and documents describing what each application does (located in <install-dir>/doc).

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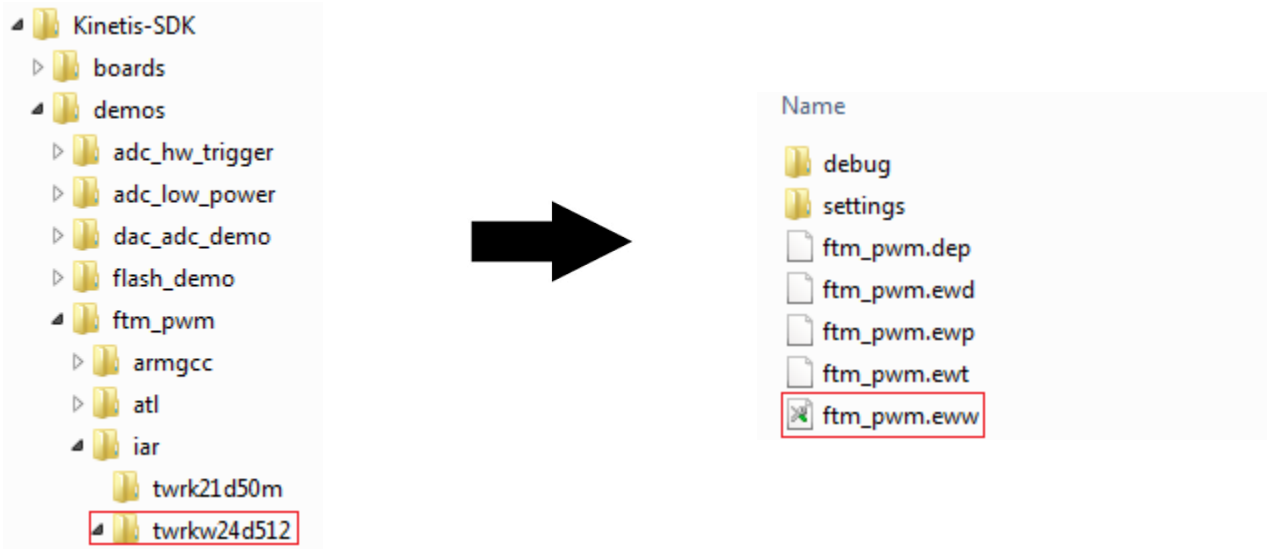
3 Example demonstration application

In this section, we will choose a demo application from the Kinetis SDK and configure the settings within IAR Embedded Workbench to allow us to load the program into the device and run the application. For this example, we will use the **FlexTimer PWM** demo application. This application could be found in <install-dir>/demos/ftm_pwm/iar/twrkw24d512. In this location, you will find an IAR Embedded Workbench Workspace file which can be opened using the IDE.



In IAR Embedded Workbench, open **ftm_pwm.eww** by selecting File -> Open -> Workspace then locate the file.

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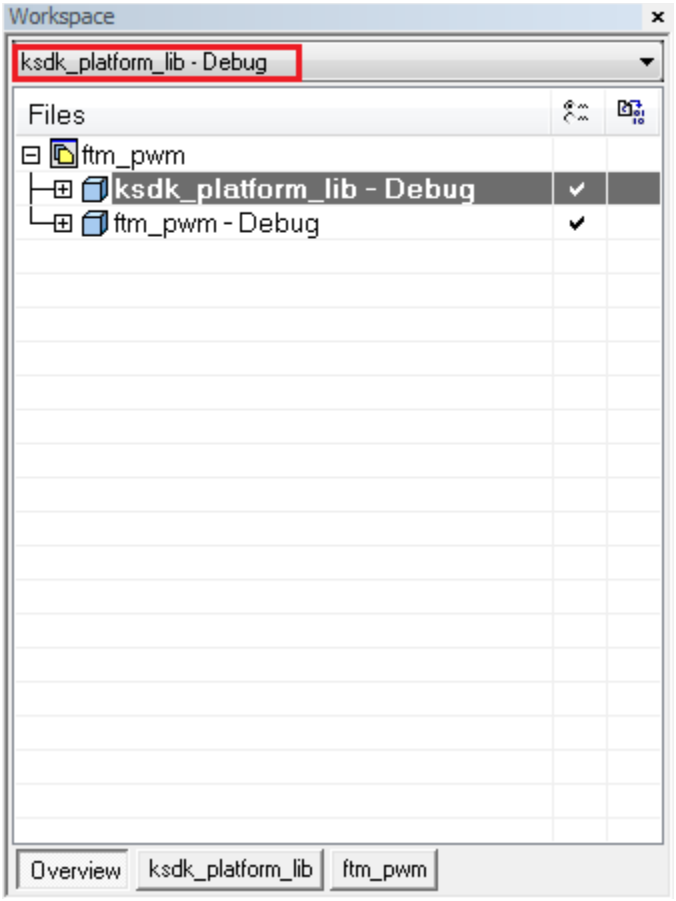
3.1 Configuring the settings in IAR Embedded Workbench

Once the workspace is opened, you should see a separate window which lists all of the files and displays the active project. First, set **ksdk_platform_lib – Debug** as active by checking if **ksdk_platform_lib – Debug** is displayed in the dropdown list or if **ksdk_platform_lib – Debug** is bold in the files overview tab. If **ksdk_platform_lib – Debug** is not set as active, then select it in the dropdown list or right click the project name and select **Set as active.**



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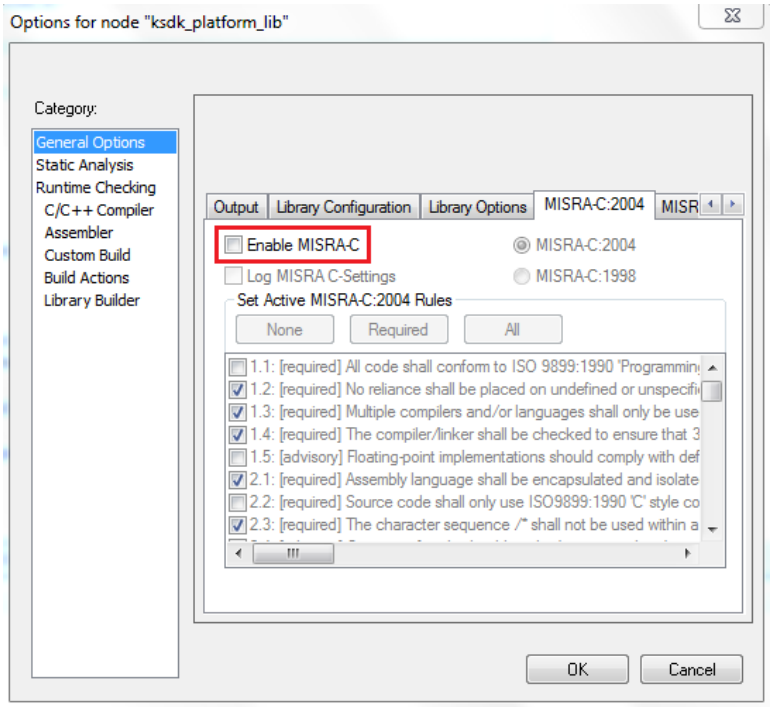
Right-click **ksdk_platform_lib – Debug** in the files list and select **Options**. In the **General Options** category click the **Target** tab. Click the button and select Freescale -> KW2x -> Freescale MKW24D512xxx5 for the target device. Then, select the **MISRA-C:2004** and make sure the **Enable Misra-C** option is **disabled**.



Select **OK** and rebuild the project by clicking Project->Rebuild All.

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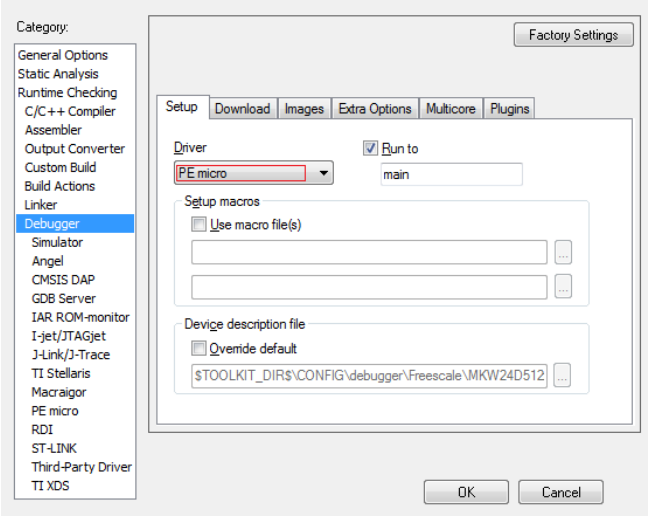
Right-click the **ftm_pwm – Debug** project and select Options. Select the **General Options** category, and as we did earlier select Freescale -> KW2x -> Freescale MKW24D512xxx5 for the target device. Select the **Debugger** category and for the **Driver** dropdown list select **PE micro.**



Then, select the **PE micro** subcategory under **Debugger** and ensure that **OSJtag** is chosen in the dropdown list of the **P&E Hardware interface type**.

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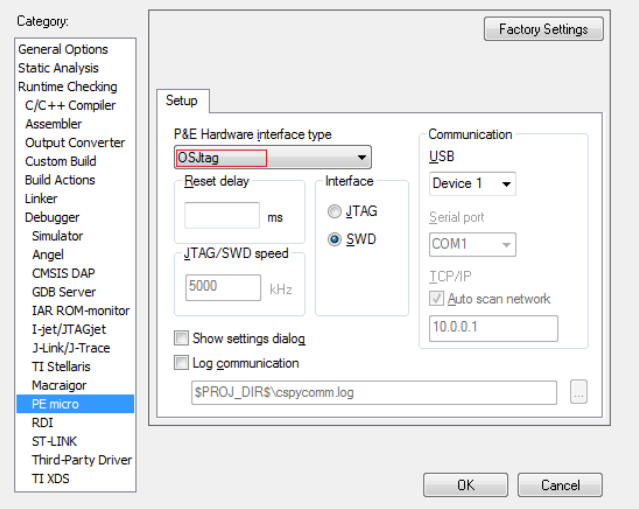

Click OK to close Options the window.

3.2 The first time connecting the device to your system

Use a micro USB male to USB male cable to connect the Oasis Tower Board to a USB port on your computer. Your computer should automatically install the necessary drivers for the device. Then, connect P&E's USB Multilink Universal development interface to a separate USB port on your computer and connect it to the JTAG connector on the Oasis Tower Board (see section 4.2). Once again, the drivers will automatically install for this device.

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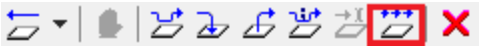
3.3 Loading the application into the device

Once the settings have been configured, compile the program by clicking the **Make** icon on the toolbar at the top of the IDE**.**

Then load the program into the device by clicking the **Download and Debug** icon on the same toolbar. You will enter debugging mode and another toolbar will appear.



Click the **Go** icon to run the FlexTimer PWM application. If everything has been done correctly, you should now see **LED D7** slowly increase its brightness for 5 seconds and then repeats. Note: you will need a jumper on J21 pins 2-3 to enable the LED (see section 4.4.2).

You can now try running different demo applications by opening a different *.eww file and repeating the same procedure. Refer to the <install-dir>/doc/Kinetis SDK v.1.1 Demo Applications User's Guide.pdf for more information about what each application does.

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4 BeeKit Wireless Connectivity Toolkit

In order to use the device's full capabilities, you must install BeeKit Wireless Connectivity Toolkit. Similar to the KSDK, the BeeKit toolkit provides demonstration projects that will allow the user to quickly see the capabilities of the device. Furthermore, installing the toolkit before connecting the device will allow your system to automatically install the necessary drivers the first time the device is connected. In this section, we will go through a step-by-step guide to generating a program using the toolkit and loading it into the device.

4.1 BeeKit Installation

First you will need to download and install the BeeKit Wireless Connectivity Toolkit. This could be found on the Freescale website by simply searching for "**BeeKit**." Once it is installed, run **BeeKit.exe** located in <install-dir>/Freescale/BeeKit. This will open the application and take you to the start page which will instruct you on how to get started.

NOTE: If you wish to use the BeeKit demo applications, you must have the **30-day time-limited evaluation** or the full version of IAR Embedded Workbench. The Kickstart version will not work because the applications exceed the size limit.

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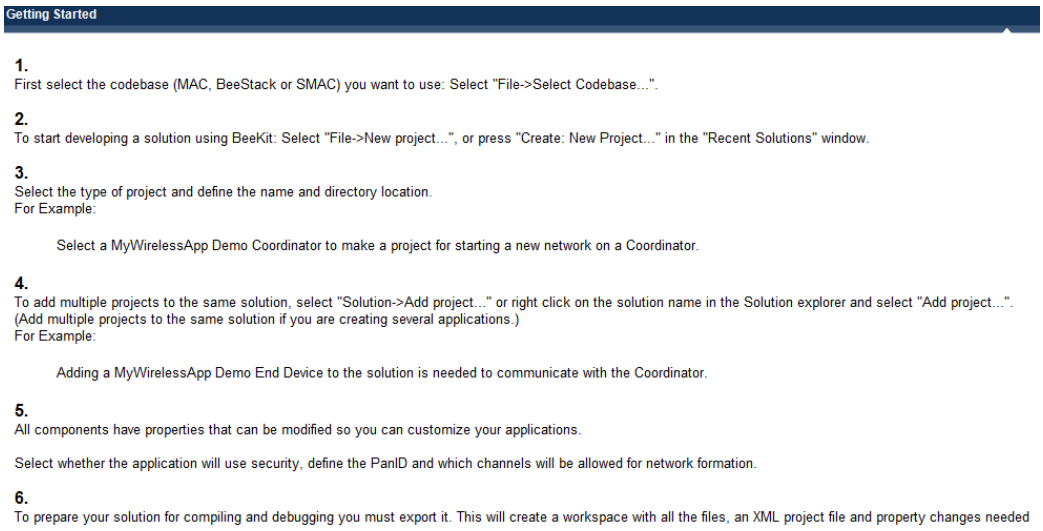
Getting Started
1.
First select the codebase (MAC, BeeStack or SMAC) you want to use: Select "File->Select Codebase...".
2.
To start developing a solution using BeeKit: Select "File->New project...", or press "Create: New Project..." in the "Recent Solutions" window.
3.
Select the type of project and define the name and directory location.
For Example:
Select a MyWirelessApp Demo Coordinator to make a project for starting a new network on a Coordinator.
4.
To add multiple projects to the same solution, select "Solution->Add project..." or right click on the solution name in the Solution explorer and select "Add project...".
(Add multiple projects to the same solution if you are creating several applications.)
For Example:
Adding a MyWirelessApp Demo End Device to the solution is needed to communicate with the Coordinator.
5.
All components have properties that can be modified so you can customize your applications.
Select whether the application will use security, define the PanID and which channels will be allowed for network formation.
6.
To prepare your solution for compiling and debugging you must export it. This will create a workspace with all the files, an XML project file and property changes needed

4.2 Creating a Demonstration Solution

Follow the instructions as shown on the **Start Page.** For further detailed instructions see the **BKWCTKQSG.pdf** located in the <install-dir>/Freescale/Documentation/BeeKit Documentation folder.

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5 System Overview

This section details the locations and descriptions of each major component and connector on the Oasis Tower Board. These components include the switches, jumpers, LEDs, and connectors.

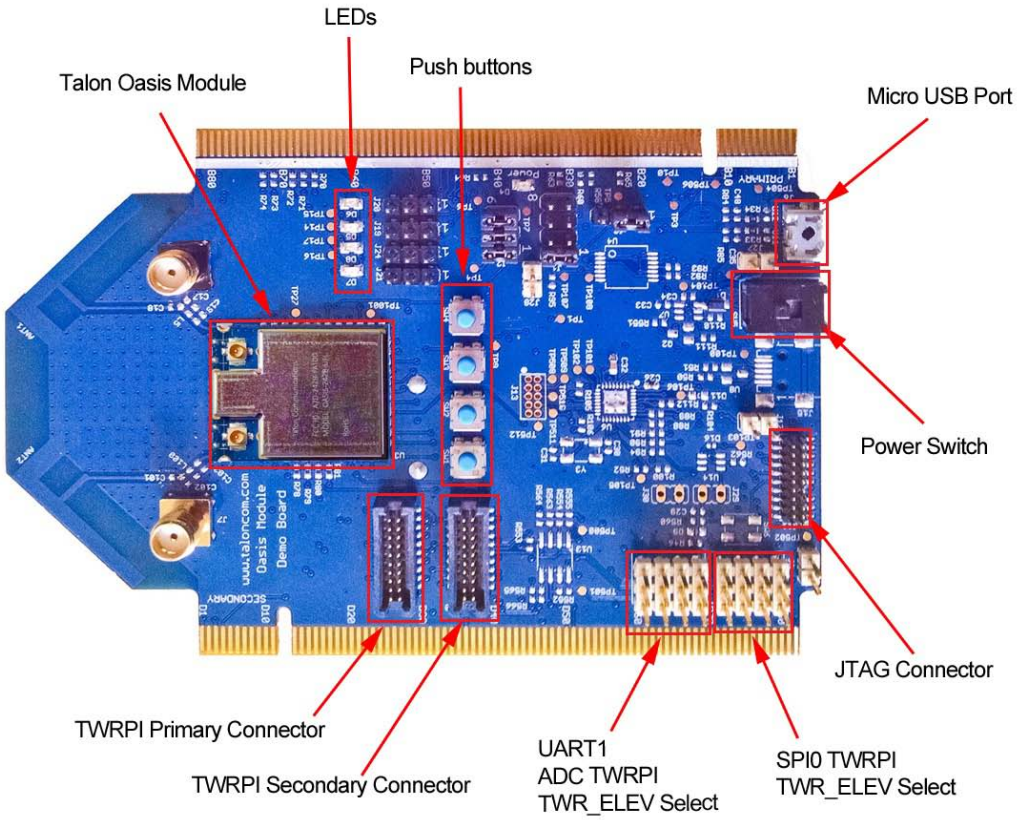

Figure 5-1. Oasis Tower Board

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5.1 Power Supply

There are various ways to supply power to the board. The following subsections will describe each method in detail. For additional information about the power management circuit see the schematics in section 5.

5.1.1 Powering the board using the USB micro connector

The device contains a USB micro-B connector on the board. This connector is one way to power the Oasis Tower Board. A jumper must be placed in pins J1 1-2 when using this method.

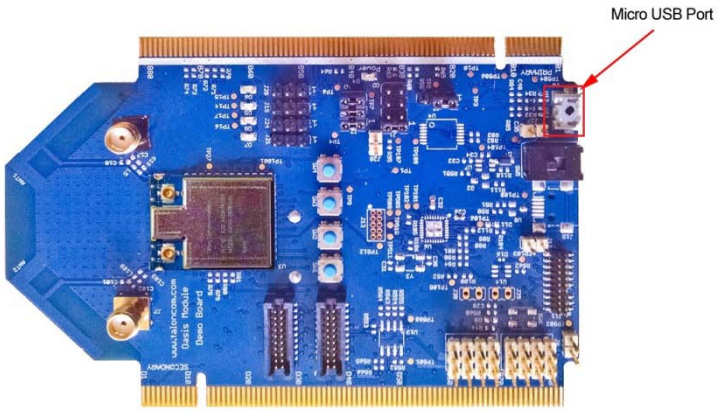

Figure 5-2a. Micro USB interface

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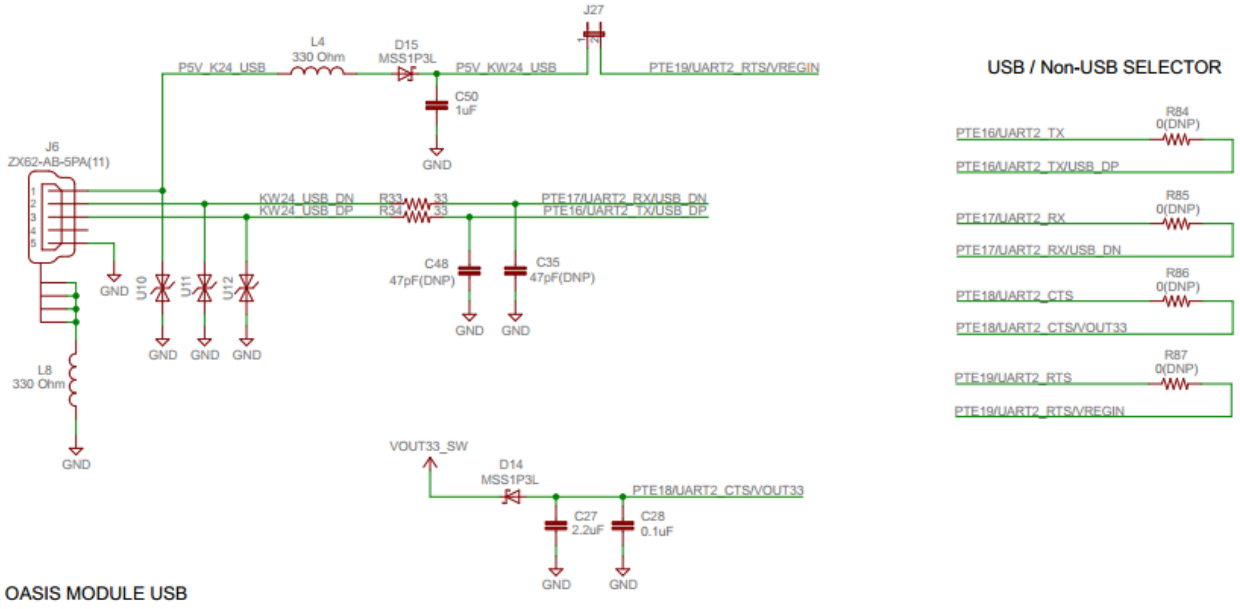

Figure 5-2b. Micro USB interface circuit

5.1.2 Powering the board using TWR system elevator headers

The board can also be powered by either the 3.3V_ELEV which requires a jumper on J1 pins 3-4, or the 5.5_ELEV which requires a jumper on J1 pins 5-6.

5.1.3 Powering the board using an external DC power supply

You may connect an unregulated supply up to 5.5VDC to J1 pins 2/4/6 and a GND pin. This method will make use of the onboard voltage regulator.

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5.2 Debug/Development Interface

A JTAG connector is used to connect emulators/probes to enable target system debugging.

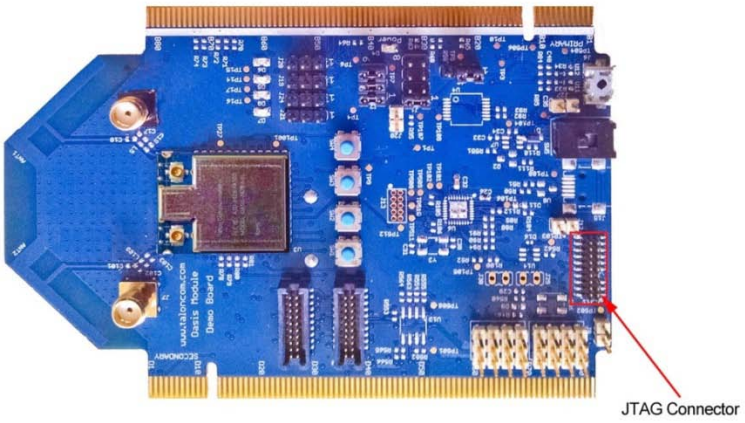

Figure 5-3a. JTAG Connector

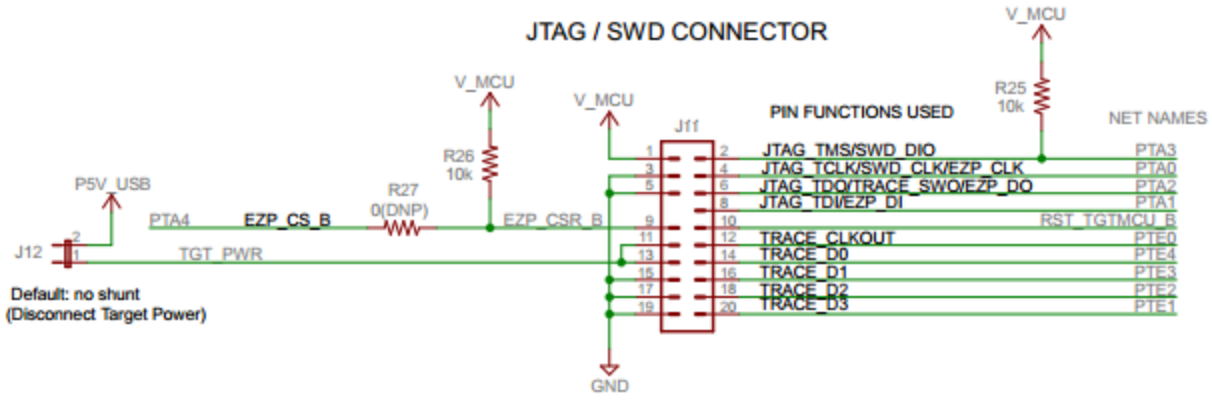

Figure 5-3b. JTAG connector circuit

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5.3 Tower Plug-In (TWRPI) Sockets

The connectors J9 and J10 support the standard TWRPI general purpose connector. These are 20-pin connectors that are mounted in a way to prevent reverse insertion.

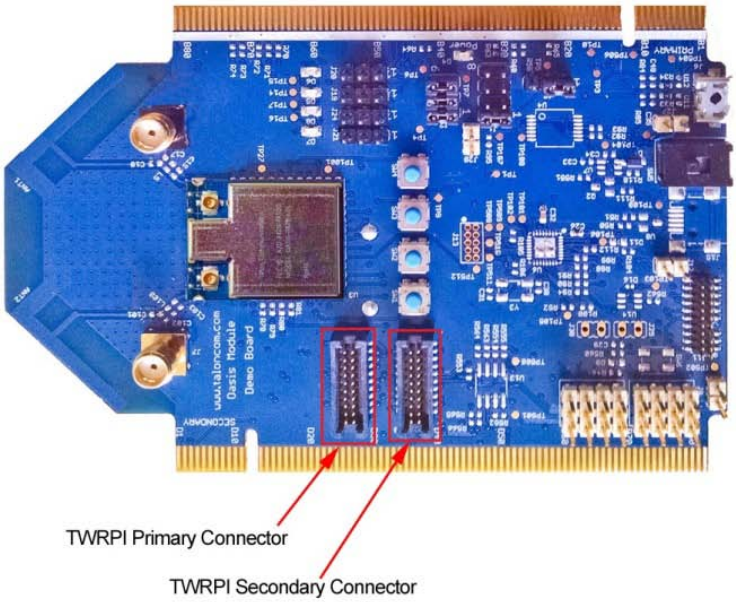

Figure 5-4a. TWRPI Connectors

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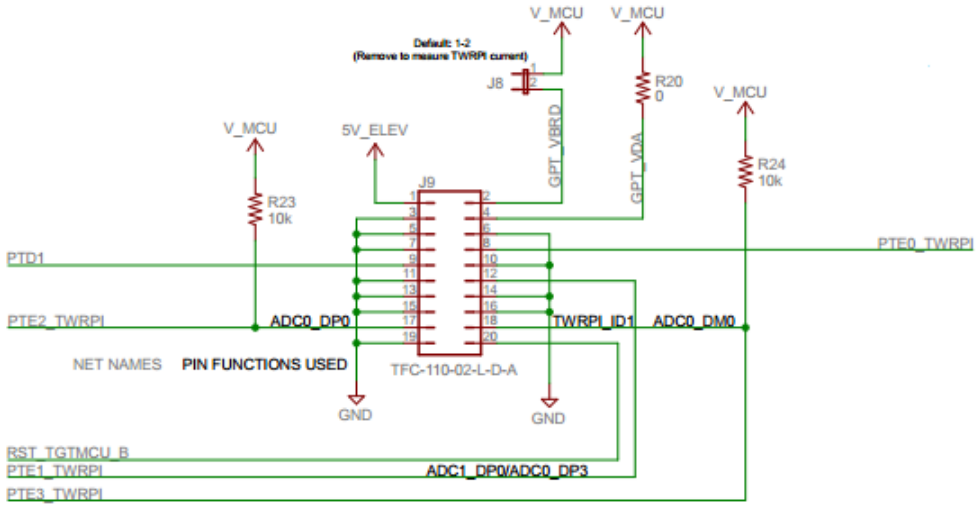

Figure 5-4b. TWRPI 20-Pin Primary Connector Circuit

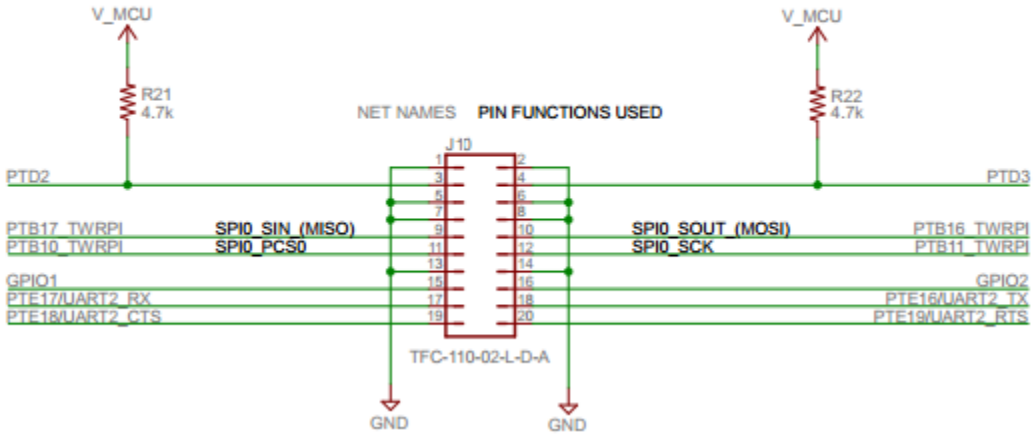

Figure 5-4c. TWRPI 20-Pin Secondary Connector Circuit

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5.4 Jumper Select

There are various jumpers on the board that provide configuration selection.

5.4.1 UART1/ADC/SPI0/TWR_ELEV Select

The pins in J17 can be configured to allow SPI communication interface for TWRPI boards or TWR_ELEV with another TWR System. The pins in J18 can be configured to support ADC for TWRPI boards or to allow a UART communication interface through TWR_ELEV with another System.

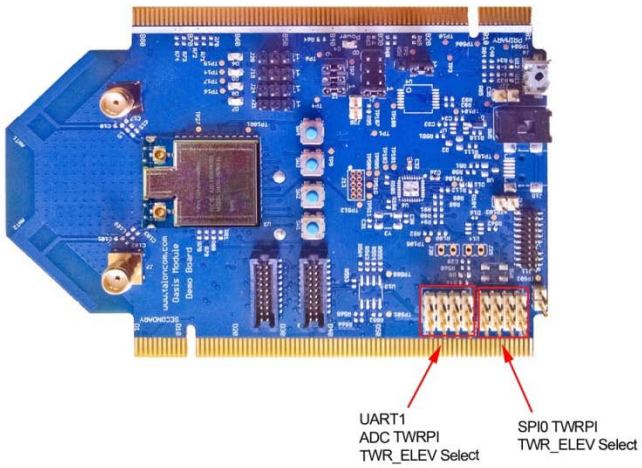

Figure 5-5a. J17 and J18 pins

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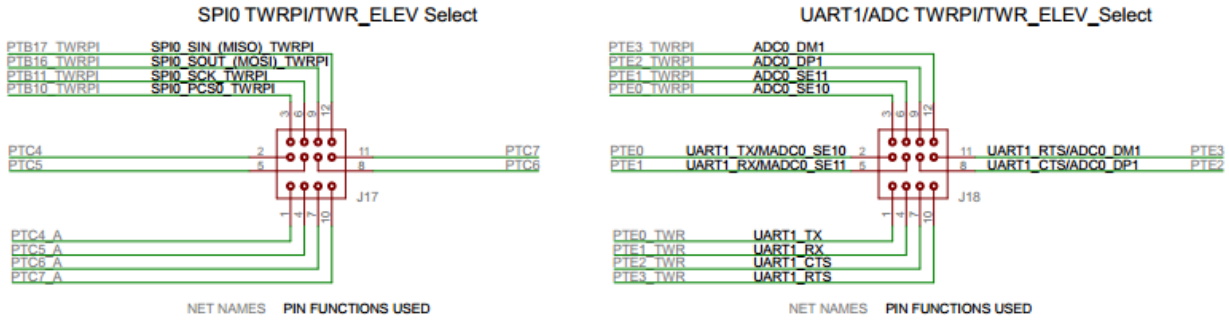

Figure 5-5b. J17 and J18 circuits

For example, in order to configure SPI for TWRPI boards, you would connect J17 pins 2-3 (SPI0_PCS), pins 5-6 (SPI0_SCK), pins 8-9 (SPI0_MOSI), and pins 11-12 (SPI0_MISO).

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5.4.2 UART1/ADC/SPI0/TWR_ELEV Select

These pins are used to configure the status of the LEDs and they also have the capability to support a UART0 connection through TWR_ELEV with another TWR system.

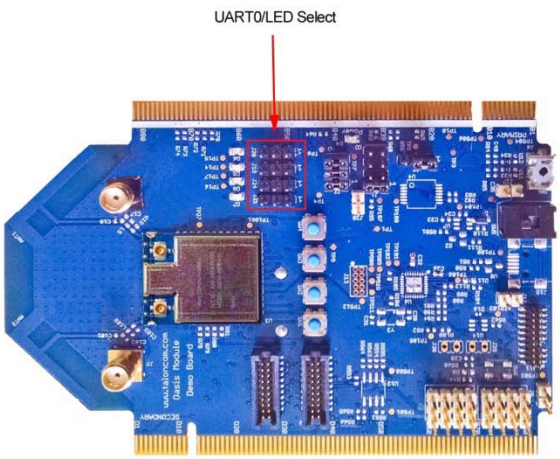

Figure 5-6a. UART0/LED Select Pins

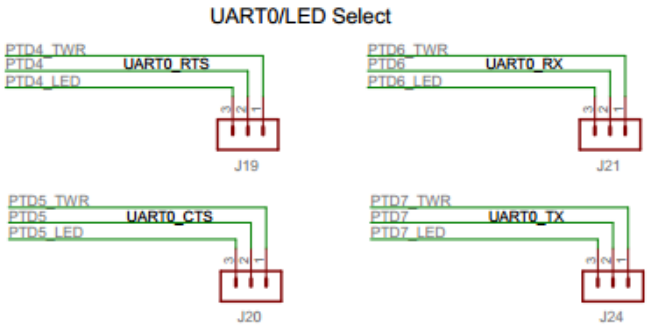

Figure 5-6b. UART0/LED Select Circuit

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5.5 Switches and LEDs

The development platform features 4 push buttons and 4 blue LED indicators. In order to configure the LEDs see section 4.4.2.

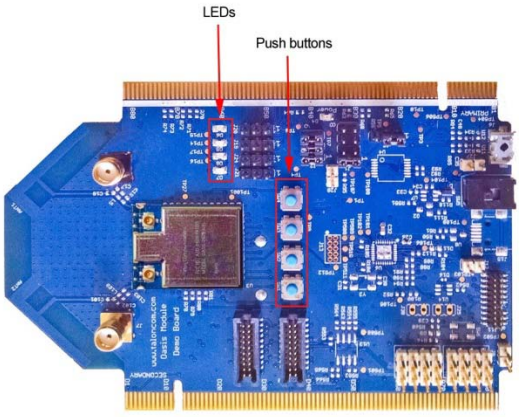

Figure 5-7a. Switches and LEDs

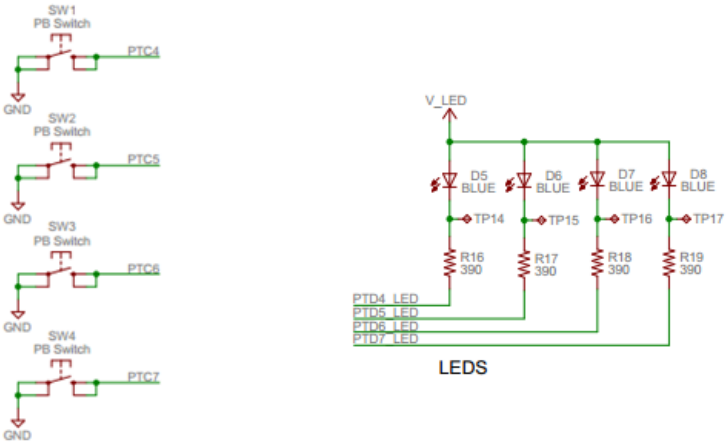

Figure 5-7b. Switches and LEDs circuits

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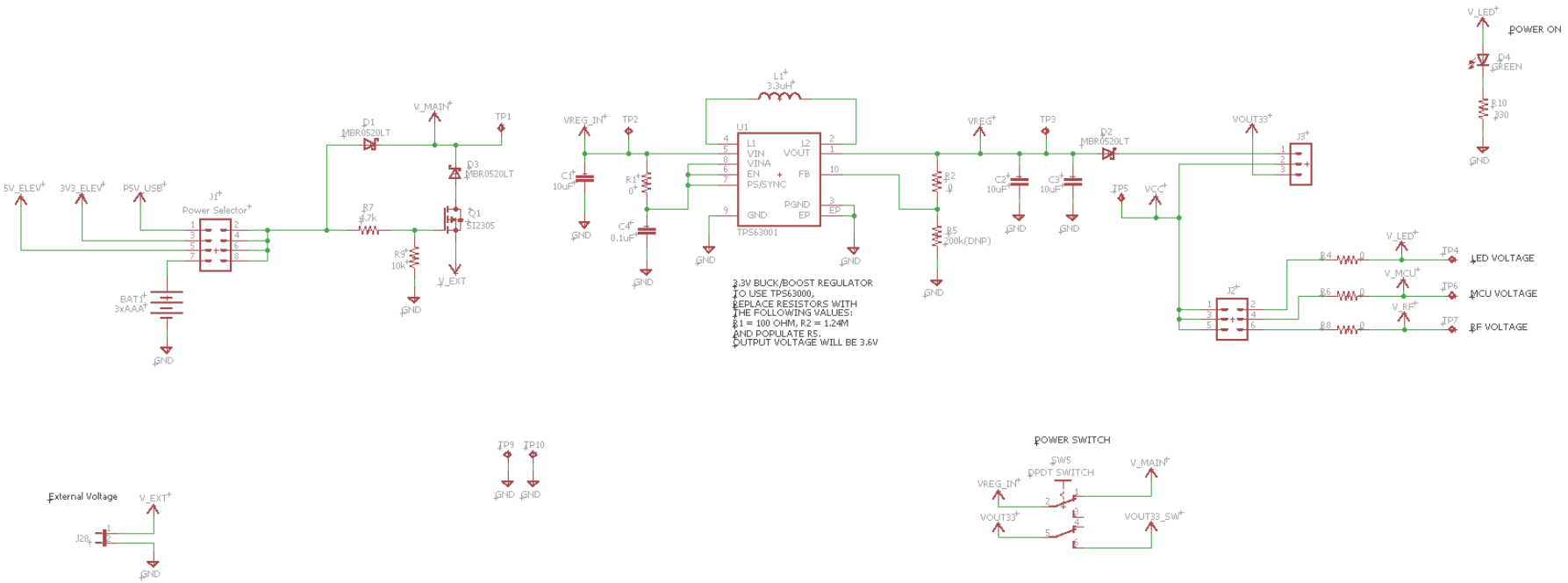
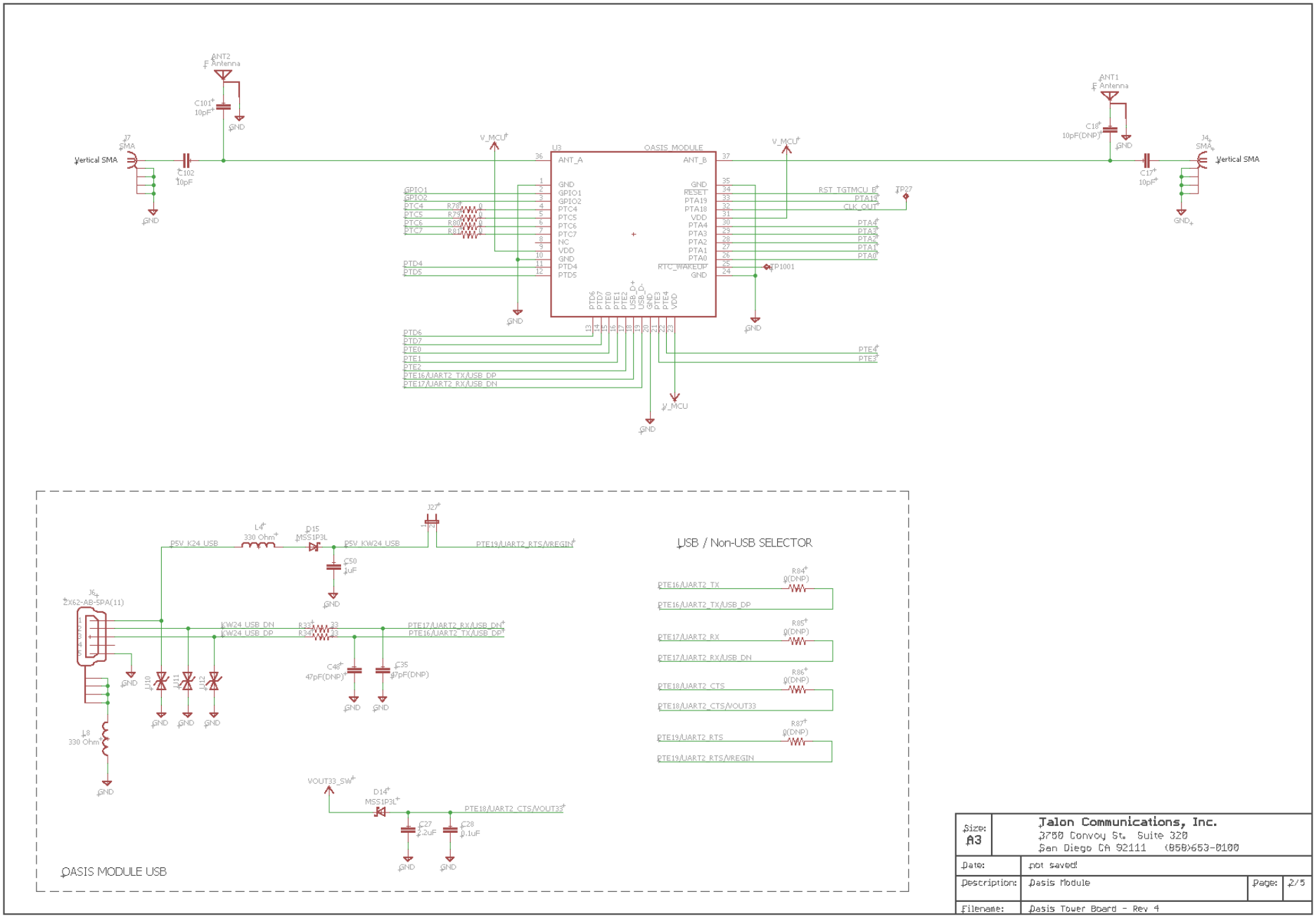
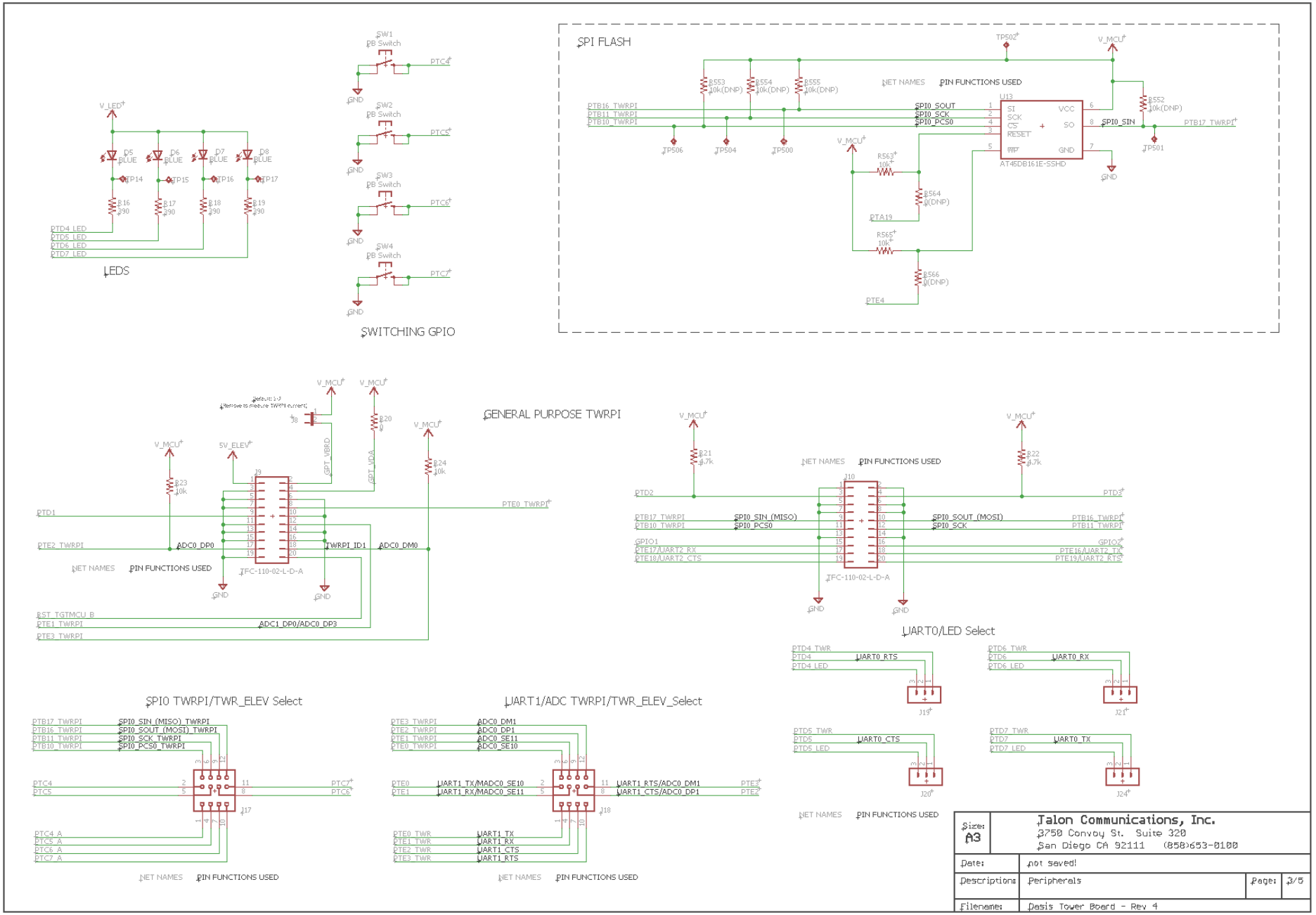
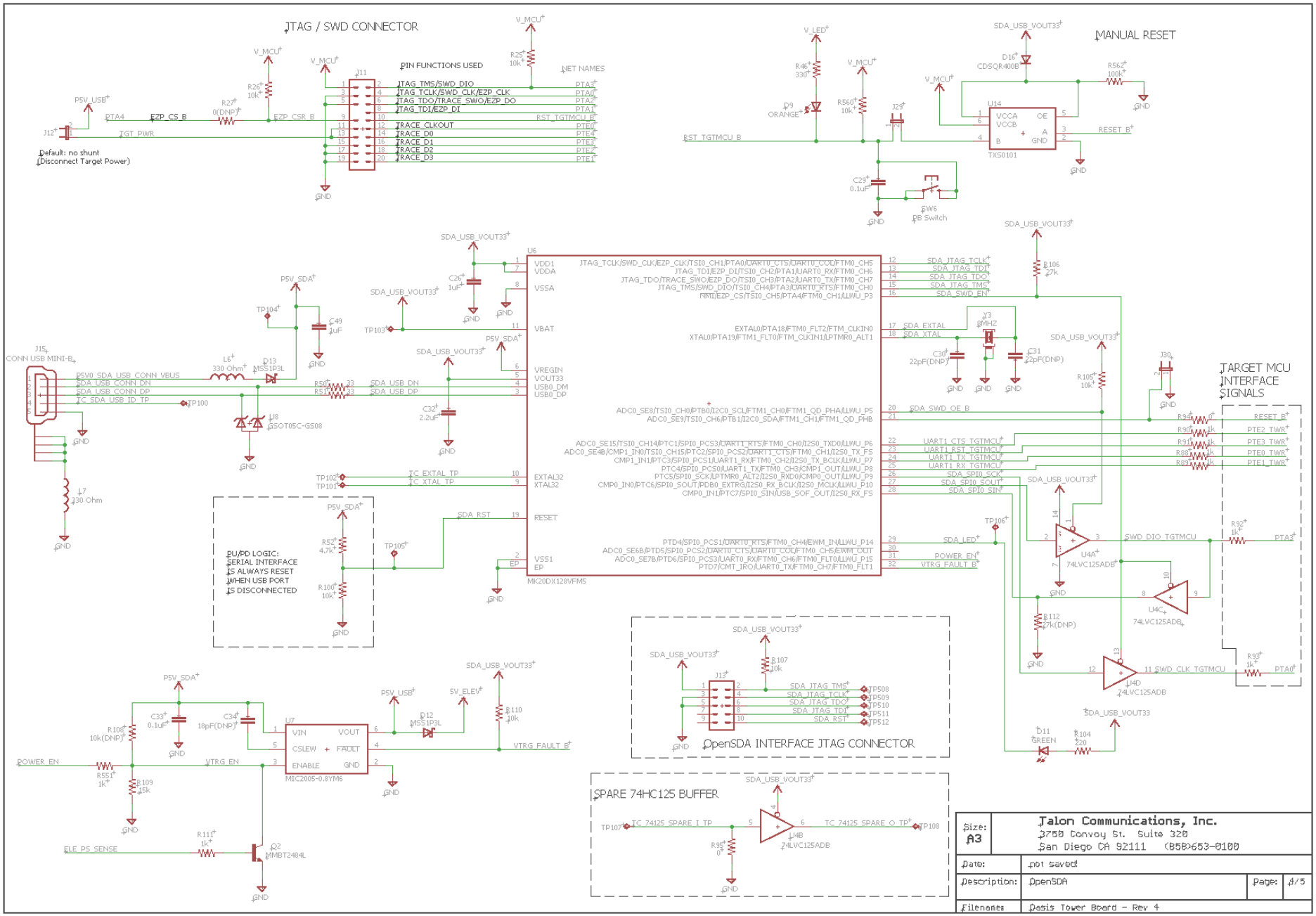
6 Schematics

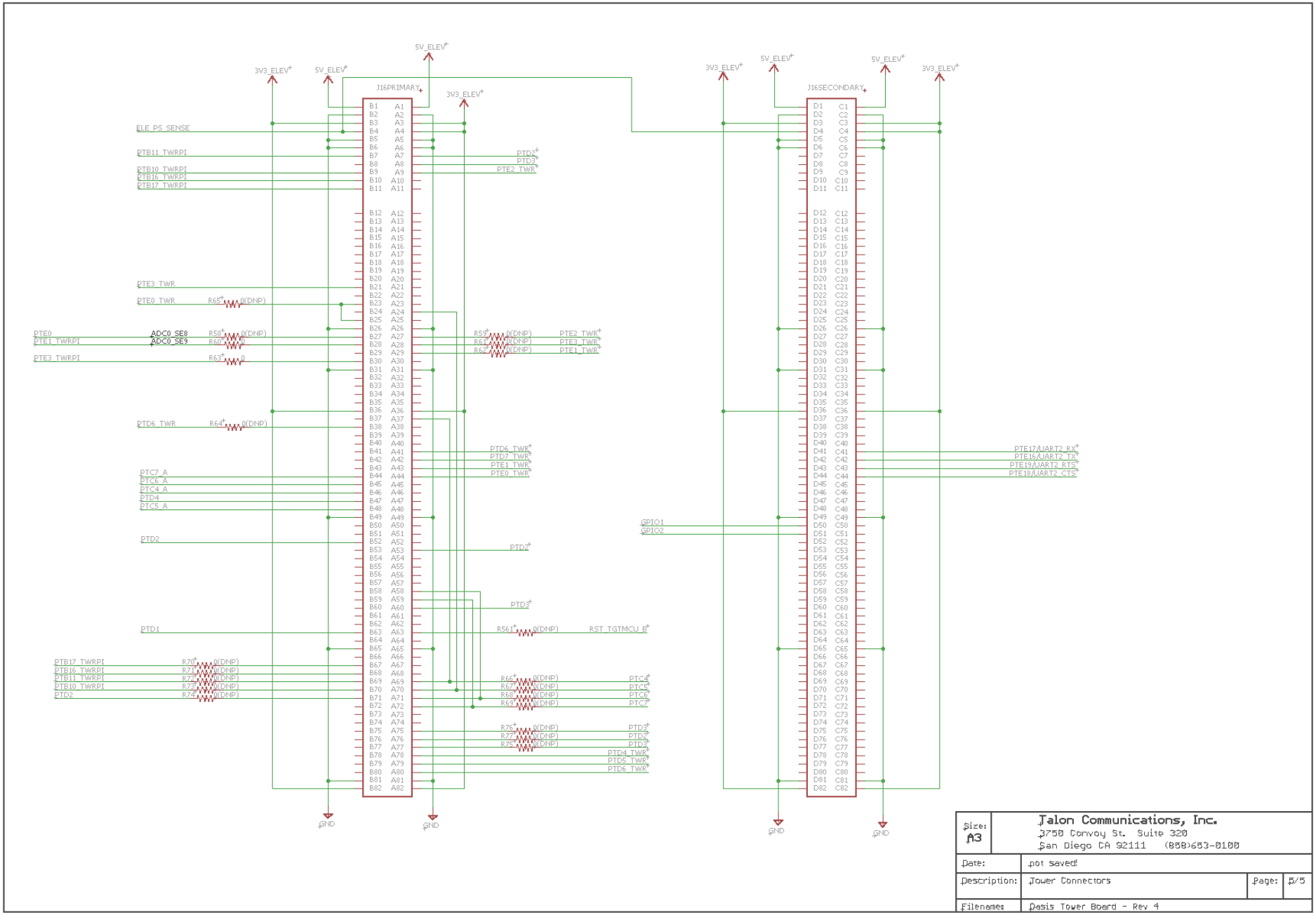


Size: A3	Talon Communications, Inc. 3750 Convoy St. Suite 320 San Diego CA 92111 (858)653-0100		
Date:	not saved!		
Description:	Power Supply	Page:	1/5
Filename:	Oasis Tower Board - Rev 4		


ANT2
F Antenna
C101
10pF
GND
J7
SMA
Vertical SMA
C102
10pF
V_MCU
U3
OASIS_MODULE
ANT_A
ANT_B
GPIO1
GPIO2
PTC4
PTC5
PTC6
PTC7
NC
VDD
PTD4
PTD5
PTD6
PTD7
PTE0
PTE1
PTE2
PTE16/UART2_TX/USB_DP
PTE17/UART2_RX/USB_DN
RESET
PTA19
PTA18
PTA4
PTA3
PTA2
PTA1
PTA0
RTC_WAKEUP
PTE4
PTE3
RST_TGTMCU_B
CLK_OUT
TP27
TP1001
ANT1
F Antenna
C18
10pF(DNP)
C17
10pF
J4
SMA
Vertical SMA
J27
P5V_K24_USB
L4
330 Ohm
D15
MSS1P3L
C50
1uF
P5V_KW24_USB
PTE19/UART2_RTS/VREGIN
J6
ZX62-AB-5PA(11)
KW24_USB_DN
KW24_USB_DP
R33
R34
33
PTE17/UART2_RX/USB_DN
PTE16/UART2_TX/USB_DP
C48
47pF(DNP)
C35
47pF(DNP)
U10
U11
U12
L8
330 Ohm
VOUT33_SW
D14
MSS1P3L
PTE18/UART2_CTS/VOUT33
C27
2.2uF
C28
0.1uF
OASIS MODULE USB
USB / Non-USB SELECTOR
R84
0(DNP)
PTE16/UART2_TX
PTE16/UART2_TX/USB_DP
R85
0(DNP)
PTE17/UART2_RX
PTE17/UART2_RX/USB_DN
R86
0(DNP)
PTE18/UART2_CTS
PTE18/UART2_CTS/VOUT33
R87
0(DNP)
PTE19/UART2_RTS
PTE19/UART2_RTS/VREGIN
Size: A3
Talon Communications, Inc.
3750 Convoy St. Suite 320
San Diego CA 92111 (858)653-0100
Date: not saved!
Description: Oasis Module
Page: 2/5
Filename: Oasis Tower Board - Rev 4


LEDS
SWITCHING GPIO
SPI FLASH
GENERAL PURPOSE TWRPI
UART0/LED Select
SPI0 TWRPI/TWR_ELEV Select
UART1/ADC TWRPI/TWR_ELEV_Select
Talon Communications, Inc.
3750 Convoy St. Suite 320
San Diego CA 92111 (858)653-0100
Size: A3
Date: not saved!
Description: Peripherals
Page: 3/5
Filename: Oasis Tower Board - Rev 4


JTAG / SWD CONNECTOR
PIN FUNCTIONS USED
NET NAMES
JTAG_TMS/SWD_DIO
JTAG_TCLK/SWD_CLK/EZP_CLK
JTAG_TDO/TRACE_SWO/EZP_DO
JTAG_TDI/EZP_DI
TRACE_CLKOUT
TRACE_D0
TRACE_D1
TRACE_D2
TRACE_D3
Default: no shunt
Disconnect Target Power)
MANUAL RESET
TXS0101
PB Switch
MK20DX128VFM5
CONN USB MINI-B
PU/PD LOGIC:
SERIAL INTERFACE
IS ALWAYS RESET
WHEN USB PORT
IS DISCONNECTED
OpenSDA INTERFACE JTAG CONNECTOR
SPARE 74HC125 BUFFER
TARGET MCU
INTERFACE
SIGNALS
Talon Communications, Inc.
3750 Convoy St. Suite 320
San Diego CA 92111 (858)653-0100
Size: A3
Date: not saved!
Description: OpenSDA
Page: 4/5
Filename: Oasis Tower Board - Rev 4


J16PRIMARY
J16SECONDARY
3V3_ELEV
5V_ELEV
GND
ELE_PS_SENSE
PTB11_TWRPI
PTB10_TWRPI
PTB16_TWRPI
PTB17_TWRPI
PTE3_TWR
PTE0_TWR
PTE0
PTE1_TWRPI
PTE3_TWRPI
ADC0_SE8
ADC0_SE9
PTD6_TWR
PTC7_A
PTC6_A
PTC4_A
PTD4
PTC5_A
PTD2
PTD1
PTD3
PTE2_TWR
PTE1_TWR
PTD7_TWR
PTD5_TWR
RST_TGTMCU_B
PTC4
PTC5
PTC6
PTC7
GPIO1
GPIO2
PTE17/UART2_RX
PTE16/UART2_TX
PTE19/UART2_RTS
PTE18/UART2_CTS
0(DNP)
Talon Communications, Inc.
3750 Convoy St. Suite 320
San Diego CA 92111 (858)653-0100
Size: A3
Date: not saved!
Description: Tower Connectors
Page: 5/5
Filenames: Oasis Tower Board - Rev 4